

# THE POSSIBILITY OF COMBINING SOME INTERACTIVE METHODS FOR STIMULATING MULTIPLE INTELLIGENCES IN STUDENTS WITHIN BIOLOGY LESSONS

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## Abstract

The purpose of this paper is to highlight how some interactive methods can be applied at different points in a biology lesson to activate different intelligence in students. As a research method we used the analysis of the current school curricula and textbooks developed for the 6th grade. By analyzing these curriculum documents, we have identified the possibility of activating multiple types of intelligence in the lessons of new knowledge transmission and recapitulation. Thus, in the 6th grade, in the "Reptile - Lizards" lesson, by applying the Cube method in the stage of transmitting new knowledge and Clustering technique in the stage of knowledge fixation and systematization of knowledge, it is possible to stimulate interpersonal, linguistic, logical, naturalist, visual, intrapersonal and, sometimes, kinesthetic intelligence. At the "Birds of Prey" lesson, the use of Think - Pair - Share method, in the stage of fixation new knowledge, and of Double Bubble Map or Venn Diagram, applied individually by means of a worksheet, in the stage of fixation and systematization of knowledge, can stimulate the interpersonal, linguistic, intrapersonal, naturalistic and visual intelligences. In the "Long Legged Birds" lesson, the use of the Star bursting method, in the stage of fixation and systematization of knowledge, and of the Response - Throw - Inquiry method, in the assessment stage of students' knowledge, can stimulate interpersonal, linguistic, visual, intrapersonal, naturalistic, and sometimes also kinesthetic intelligences. For the recapitulation lesson entitled "Reptiles", we propose applying the new interactive method called Search - Think - Build, through which the intrapersonal, interpersonal, linguistic, visual and natural intelligences of the students will be required. In conclusion, it can be said that by combining two interactive methods, carefully selected by the teacher, five or six types of intelligence can be activated in the students.

**Key words:** lessons of biology, interactive methods, multiple intelligences, Search - Think - Build method

Already in the first half of the 20th century, the authors of the most relevant works of a methodical nature referring to the teaching of natural sciences in the Romanian secondary education, paid special attention to the pupils' learning activity within a lesson.

Through the contents of his books "How to learn Biology", "Educating the mind through Biology", "Old School and New School" and "Educational School", Moisesescu (cited by Petruța, 2005) contributed to "changing the teaching methods used in the old, instructive school, in which the student was "the slave of the book", with the new, educational school methods [...] in which the student observed with his senses, described with his words, thought with his mind, such that the whole or almost entire lesson was his work (Petruța, 2005).

Some of the methods mentioned by Moisilu, Kirițescu and Simionescu (cited by Petruța, 2005), such as independent observation or observation guided by the teacher, heuristic conversation and

modeling made using molds or drawing, are also used by today's teachers in biology lessons, being considered active-participatory methods. These heuristic methods ensure the active participation of students in acquiring new knowledge.

At present, interactive methods are also part of the diverse range of methods that can be used in biology lessons to ensure students' success in learning. These, alongside active-participatory methods, are considered to be modern methods.

As Cerghit (2006) mentions, "the interactive methods favor an interactive or interdependent group learning". Whether they are large groups (entire class), small groups or only pairs, students learn actively, taking place exchanges of knowledge, ideas, experiences, opinions, etc, in order to jointly solve a work task".

Referring to these methods, Iancu Ciobanu (2009) mentions that they are "used in the sociocentric model of training, centered on group work" and that they "contribute in particular to the development of the individual within it".

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In full agreement with the above mentioned author, it can be stated that in the literature, many pedagogues and didactics have emphasized the role of interactive methods in the development of thinking, imagination, intelligence, creativity, in the formation of positive moral traits of behavior, in the consolidation of moral qualities, in stimulating learning styles, in self-knowledge, etc.

“The interactive methods/techniques are applied successfully in the educational practice, both abroad and in our country, the didactic activities becoming this way more attractive for the schoolchildren of all ages” (Petruța, 2013a).

Taking into account the results obtained in a previous research and published in the article “Multiple intelligences stimulated within the lessons by the practicum students of the Faculty of Sciences” (Petruța, 2013b), according to which in the mixed lessons the intelligences that were most often stimulated were the verbal, logical, visual and naturalistic intelligences, while in the lessons of recapitulation only two types of intelligences were activated in the students, I proposed as the aim of the current research the highlighting of the possibility to stimulate several types of intelligences within the lessons, by the combined application of interactive methods. The objectives were as follows:

- identifying of the biology lessons for the 6<sup>th</sup> grade, during which some interactive methods can be used in combination;
- highlighting how to apply two interactive methods at different times of selected lessons, in order to stimulate multiple intelligence in students;
- creating a new interactive method, that can be applied in the recapitulation lessons, with the aim of stimulating in students as much intelligences as possible.

## MATERIAL AND METHOD

To highlight the possibility of applying combined interactive methods in biology lessons to stimulate more intelligences in pupils, we used as a research method the analysis of current school curricula and school manuals developed for the 6<sup>th</sup> grade.

## RESULTS AND DISCUSSIONS

As Cojocariu (2010) mentions, “selecting, designing and capitalizing on the most appropriate teaching strategies are vital processes for ensuring effective learning”.

Applying interactive methods in a biology lesson involves, besides students' willingness to cooperate, both the teacher's choice for these

methods and his thorough preparatory work, reflected in the design of the lesson.

For the 6<sup>th</sup>-grade student's knowledge of green lizard, in the lesson “Reptiles – Lizards”, the teacher can choose to apply the Cub method. This method, used in didactic activities with both pre-school and pupils of any age, can be used successfully in biology lessons where students understand and learn about a type of organism (plant / animal).

The teacher will divide the class into six groups, and each group will have to solve independently a task listed on one of the sides of the cube, as follows:

Group 1 - to describe the environment, shape, color and size of the green lizard;

Group 2 - to compare the body structure of the green lizard with that of the lake frog;

Group 3 - to identify the green lizard adaptations to the living and feeding habits;

Group 4 - to analyze body structure and green lizard limbs;

Group 5 - to identify lizards related to the green lizard;

Group 6 - to argue why the green lizard is a useful animal and why it is considered a reptile.

At the end of the independent work, each group manager will read how he completed the work sheet. After discussing the results obtained by each group, the teacher will write the lesson scheme to the blackboard. Thus, all students will have correct and complete notions about the green lizard and, in general, about the lizards.

At the end of the lesson, in order to fix students' knowledge of the green lizard, the teacher can choose to apply the Clustering technique, by groups. It is possible to keep the same groups previously set up for applying the Cub method, and each student of a group will complement the Cluster with one or more ideas that come to mind about the green lizard. Figure 1 shows a possibility to build a cluster about the green lizard. If the level of education (training) of the students of a group is higher, in terms of acquiring biology knowledge, then the teacher may ask the students to make a conceptual map.

By applying the cube method and one of the two techniques of visual representation of the information about the green lizard, with groups of students, it is stimulated their interpersonal intelligence first of all. In addition, the use of the first method activates linguistic intelligence (by exposing one's own ideas using the language specific to biology, by explaining the meaning of the reptile concept), logic-mathematical intelligence (by establishing logical connections between ideas regarding the adaptation of the

green lizard to the living environment and feeding mode) and naturalistic intelligence (by recognizing other species of lizards). Applying the Clustering/Conceptual map technique also enriches spatial intelligence (through graphic representations), logical-mathematical intelligence (by structuring and classifying ideas about the green lizard), linguistic intelligence (by mentioning its own ideas

about the species under consideration, using scientific concepts biological), intrapersonal intelligence (by focusing each student on the work task). Sometimes, if students are asked to make as class or homework a lizard by origami technique, then their kinesthetic intelligence will be also stimulated.

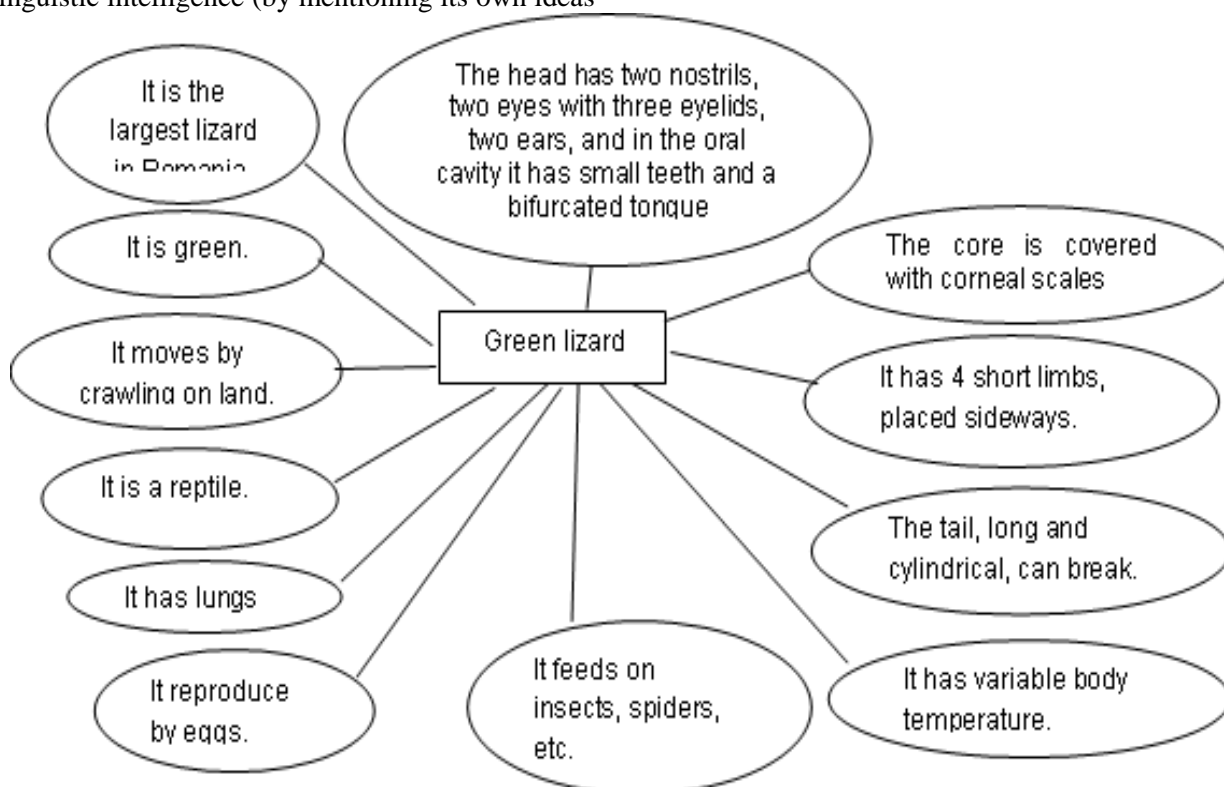


Figure 1 Cluster – Green lizard

Another lesson identified by the research in the 6th grade manual, during which the teacher can opt for the combined application of interactive methods, has the theme of “Birds of Prey”. Thus, at the knowledge transfer stage, the teacher can choose for the Think-Pair-Share method, asking the students to answer the following question: why do the chicken hawk and the owl be considered rapacious birds? The teacher will ask the students to think for 1-2 minutes on an answer. Then it will group students in pairs to discuss individual responses and to issue a common answer. At the end of the working time, the teacher will ask some pairs to present the common answer they have reached. Applying this method has helped stimulate intrapersonal, interpersonal and linguistic intelligence of students.

Starting from the answers given by the students, the teacher will analyze with the pupils the external anatomy and certain physiological aspects of the two raptors by using certain teaching methods, for example, padded birds, drawings, a power point presentation, images, or a didactic film.

In the stage of knowledge fixation and systematization, in order to highlight both the particular aspects of the two birds of prey, and the common ones, the teacher can ask the students to fill in, in groups or individually, on a work sheet, a Double Bubble Map (Figure 2) or a Venn diagram, of own choice. Thus, students will identify the similarities between the two species, establishing the general characters of the raptors, but also the differences between them. After the working time has expired, we will discuss how students completed one of the two graphical representations, establishing the right answers. By applying one or other of the two techniques, visual intelligence (by realizing graphical representations), naturalistic intelligence (by the ability to establish the similarities and differences between the two species of raptors), linguistic intelligence (by the ability to use language specific to biology), intrapersonal or interpersonal intelligence will be activated to students, depending on how the worksheet is filled in, individually or by group.

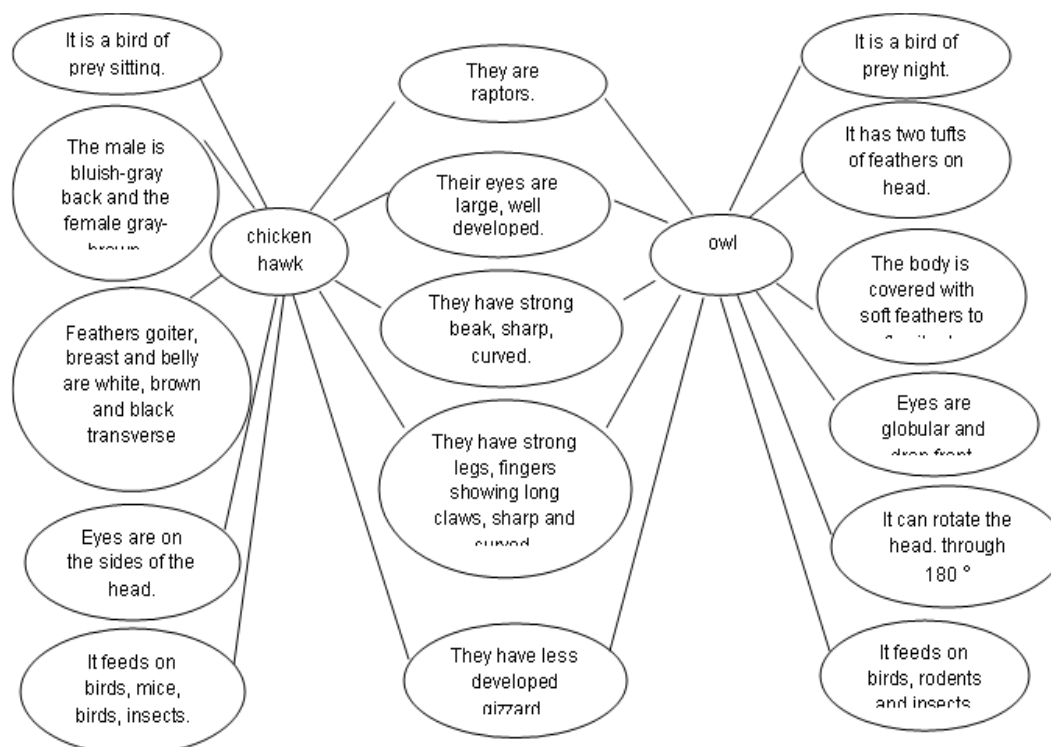


Figure 2 Double Bubble Map – Birds of Prey

In the lesson “Long-legged birds”, the teacher can also choose for other moments of the didactic activity in which to apply interactive methods in combination with the above.

In the lesson "Birdwatching", the teacher can also opt for other moments of the didactic activity in which to apply interactive methods in combination, compared to those mentioned previously.

Thus, at the stage of setting and systematizing the knowledge, the teacher can use the Star bursting method. Students of the class will be divided into five groups. They will be asked to formulate as many questions as possible about the type of animal studied within the lesson (white stork) such as: What? When? Why? Where? Each group will consider creating one type of question. For example, the following sets of questions could be formulated:

Group 1: What is the white stork's living environment? What are the adaptations of this bird to the living environment? What are the stork's adaptations to feeding?

Group 2: What species of white stork do you know? What role does the interdigital membrane existing between the three front fingers of the stork? What kind of feeding does it have?

Group 3: When the white storks fly away from our country? When are they coming back? When they reproduce?

Group 4: Why do white storks leave our country? Why are they called long-legged birds? Why are the storks good flyers?

Group 5: Where do the storks live? Where do they make their nest? Where does the storks fly away (migrate) in the autumn, etc?

After this stage of the lesson, for assessing pupils' knowledge about long-legged birds, the teacher can use the Response - Throw - Interrogate method). Thus, each student who formulate a question from the content of the lesson, addresses it to another colleague, chosen by throwing a ball. If he/she knows the correct answer, he / she will then ask a question for another pupil, and if the wrong answer goes out of the game, the answer will be given by the student who has asked the question. On this occasion, students can find the correct answer to some of the questions they have asked before, when the Star Explosion was applied.

By applying the two interactive methods, the interpersonal, linguistic, intrapersonal and naturalistic intelligences of the students will be stimulated. If students will be required to make a stork using the origami technique, in class or as a homework, then their kinesthetic intelligence will be solicited.

For the recapitulation lesson “Reptiles”, we propose the application of a new interactive method called Search - Think - Build. It can be used only at a certain point in the lesson, but also as a didactic strategy, during the entire teaching activity, assuming the combination of different methods, didactic means and forms of organizing the class of students.

The class of students will be divided into as many groups as the themes will be recapitulated, for instance, in biology, the number of groups will correspond to the number of classes of organisms / species studied in a vegetal or animal class of organisms.

The representative of each group will extract from a bowl a ticket bearing the name of a class of organisms or a type species and an envelope with pictures and different sentences referring to all the classes of organisms / type species recapitulated. Therefore, in the envelope there will be both sentences referring to the class of organisms / species analyzed by a group, but also sentences that will refer to the other classes of organisms / species, which can be considered distractors.

The student will return to the group he is a member of and will require each member to extract from the envelope a certain number of sentences that will be mentioned by the teacher based on the total number of sentences included in the envelope and the number of students within a group. For example, if the envelope contains 50 sentences and the group will consist of five students, then each student will extract ten sentences.

Thereafter, the activity will be carried out individually. Each member of the group will carefully read the sentences extracted and select only the sentences related to the class of organisms / species envisaged. This activity involves a process of memory searching of previously acquired notions, but also a thinking process, to identify the correct sentences.

Then, the activity will continue on the groups, each of them building a descriptive-interrogatory graphical organizer, which will contain a picture and different sentences.

The representative of each group will stick in the center of a sheet of paper / poster the image of the class of organisms / species analyzed. He will ask each member to read, in turn, the selected sentences. These will be analyzed by the rest of the students in the group, and if they will appreciate that the sentences are correct, the group's representative will stick them on the paper / poster. Each member of the group will draw lines to personally identified sentences. Thus, each group will build a graphical organizer of the recapitulated class of organisms / species. Next, they will consider questions that can be formulated from the sentences existing in the graphical organizer, such as: Why? A group will have to ask questions for the rest of the students in the class. For example, if the class has been

divided into four groups, a group will ask three questions.

Thereafter, the work will be carried out frontal. The representatives of groups will display the graphic organizers on the blackboard. In turn, each will present the content of the graphical representation. Optionally, another member of the group can demonstrate on a drawing, micro-drawing, imagine, slides, various aspects mentioned in sentences read by the group's representative. The graphical organizer will be analyzed by the teacher with the help of class students. Then, the group's representative will ask one question, from those formulated previously, to the other groups in the class. If a group does not know or mistakes the answer, it can be given by another group of students. Optionally, the correct answers of each group can be noted, ultimately establishing the winning group.

By presenting and discussing all the graphic organizers, but also by answering the questions, it is possible to consider that all the pupils participated in the recapitulation of the concepts envisaged.

Below, we exemplify how to apply the interactive Search - Think - Build method to the "Reptiles" recapitulation (review) lesson.

If the team of the class consists of 20 students, then four groups of five members will be formed, considering that within the reptile class four species were studied: green lizard, house snake, dry land turtle and crocodile.

The envelope will contain an image of the above mentioned species and a set of sentences, for example: It is a terrestrial animal. It is green. It lives in grassy and sunny places. The eyes have three eyelids. The tongue is short and bifurcated. The trunk is covered with corneal scales. The tail, long and cylindrical, can break. It has 4 short limbs, placed sideways. It feeds on insects, spiders, etc. It has variable body temperature. It reproduce by eggs, which are hatched in the sun. It lives through forests, besides the waters and households. It has concealed eyelids. It has a white-yellow spot on each side of the head. Has the tail sharpened to its end. It moves by crawling on land. It swim into the water. It has no limbs. It feeds on mice and lizards. It can swallow more voluminous animals than his body. It has no sternum, scapular and pelvic belt. It shedding. It lives in Banat, Oltenia and Dobrogea. It has a crust, with protective role, made of shell and plastron. Its front limbs are retractable. It has no teeth. It is a herbivorous animal. It is a vertebrate animal. It has the body protected by corneal plaques, doubled by bone plates. It breathe through the lungs. It lives in the Nile River. It has

the tail flattened laterally and uses it to swim. It crawls hard on land. It is a carnivorous animal. It has a long muzzle, on top of which the nostrils are found. It is a terrestrial and aquatic animal. It has conical teeth stuck in dental alveoli. It is a reptile. Hibernates in winter. It feeds on fish, mollusks, aquatic birds, etc.

A representative of each group will extract from a bowl a ticket with the name of the species he is going to analyze, and an envelope containing the 40 sentences mentioned above. This way will be distributed the work tasks, for example, group 1 will consider the house snake.

Then, the representative student of each group returns to the group and asks each member to extract 8 sentences from the envelope, of their choice. Students read the statements and decide which of these refer to the house snake.

Next, the group's representative sticks on a sheet of paper the image with the house snake and sentences considered correct by all students of the group about this species. They will formulate questions for groups 2, 3 and 4, such as: Why it is hibernating in the winter? Why it is shedding? Why does not have the sternum, scapular and pelvic belt?

Then, the graphic organizers of the four groups will be exhibited, presented and analyzed. If this is the case, the wrong assertions will be corrected, and eventually will be mentioned other sentences that could be added to the graphical organizer to characterize a species. The representative of each group will address the questions asked for the other groups, and finally the winning group will be established.

By applying this method, the intrapersonal, interpersonal, linguistic, visual and naturalist intelligences of the students will be stimulated.

## CONCLUSIONS

Our research highlighted two possibilities of combining two interactive methods in mixed biology lessons:

- at the stage of new knowledge transfer and at the stage of their fixation and systematization - the Cube method and the

Clustering technique, the Think-Pair-Share method and the Double Bubble Map method or the Venn diagram;

- at the stage of consolidating the knowledge and at the stage of its evaluation - the Star Explosion, and Response - Throw - Interrogate method.

In selecting and combining interactive methods in a lesson, the teacher should consider the possibility of activating as many intelligences as possible for students. Consequently, if the first method to be used will activate certain intelligences, the second method will have to complement the set (series) of previously stimulated intelligences with at least one other intelligence. Thus, five or six intelligences can be activated in students.

By applying the interactive method called Search - Think - Build, five types of intelligence can be activated in students.

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